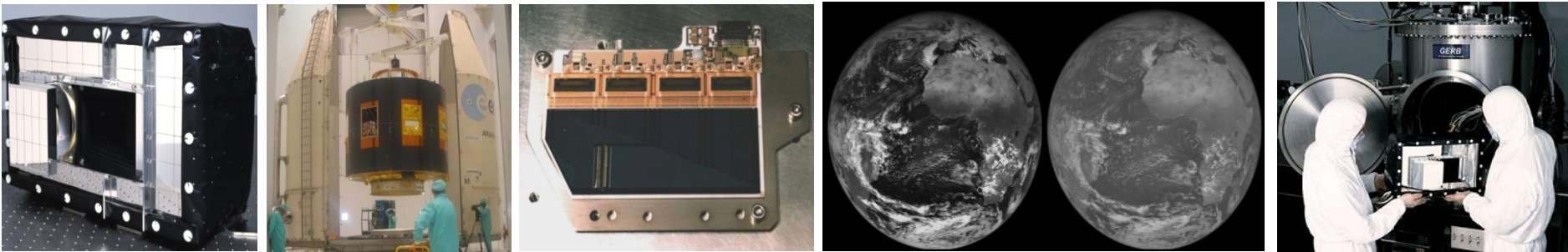


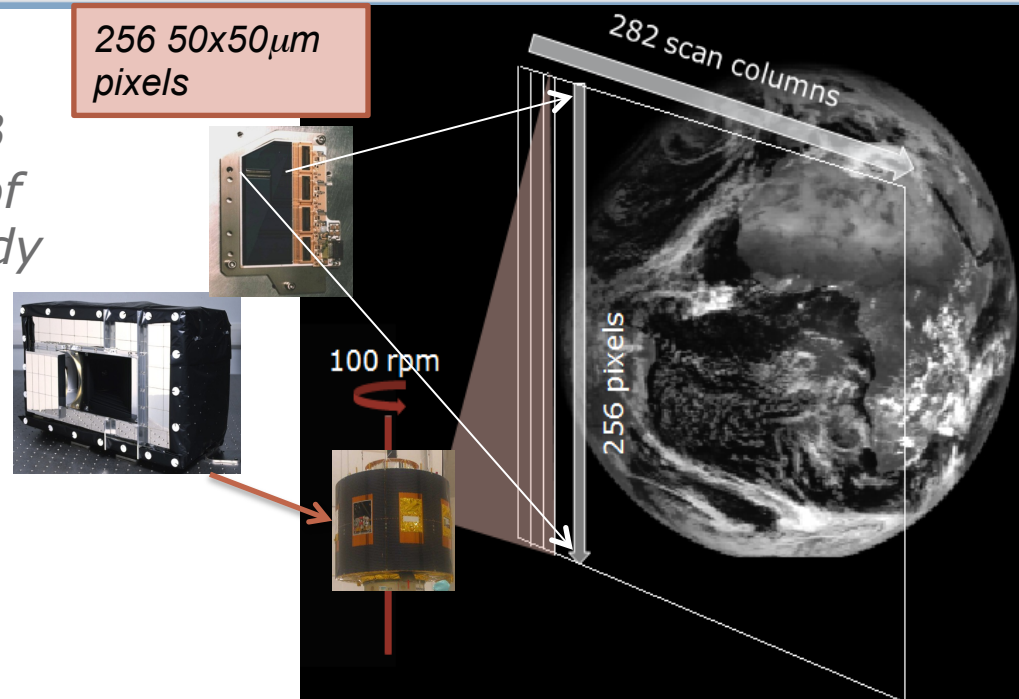
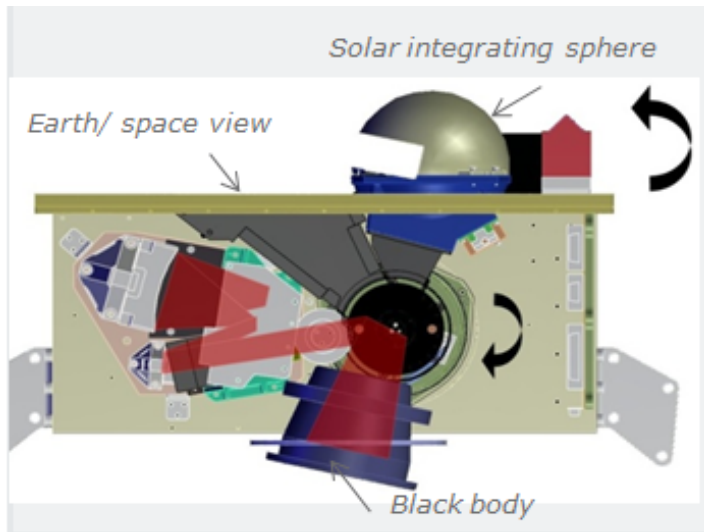
# GERB Programme & Instrument status



Jacqui Russell, (GERB project scientist) Imperial College

## GERB Observations

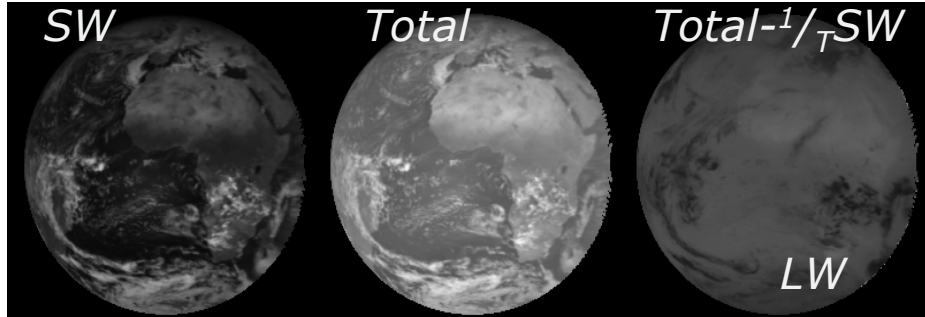
*METOSAT rotates 100 times per minute. Every rotation 256 GERB pixels obtain a 40ms snap-shot of an Earth column, and a black body view 0.3s later.*



*It takes 282 rotations (~3mins) to obtain one Earth scan including space data and black body views for calibration*

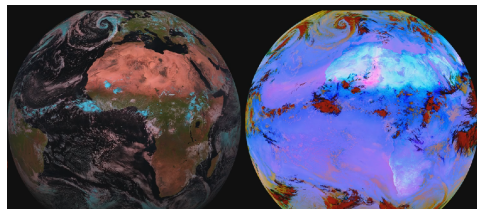
*Instrument relies on accurate rotation information from the satellite sensors and tight control of the mirror rotation to obtain good pointing.*

## GERB Observations

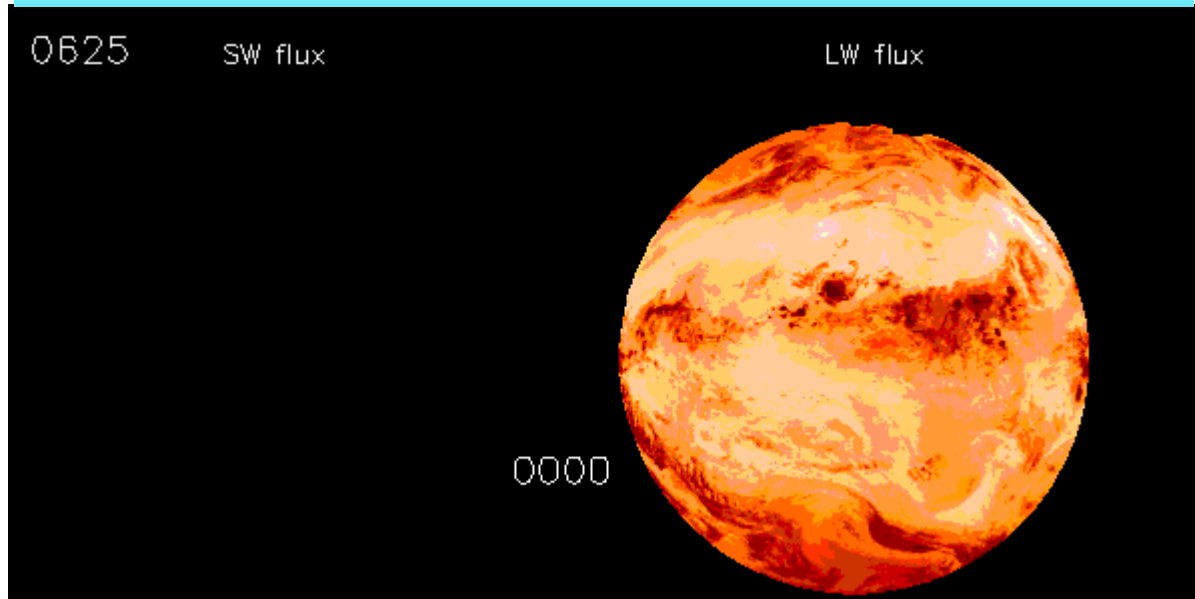


*In ~6min GERB measures radiances for Earth disk in both SW (0.4-4 $\mu$ m) and TOTAL (0.4 - 100 $\mu$ m) broadband channels*

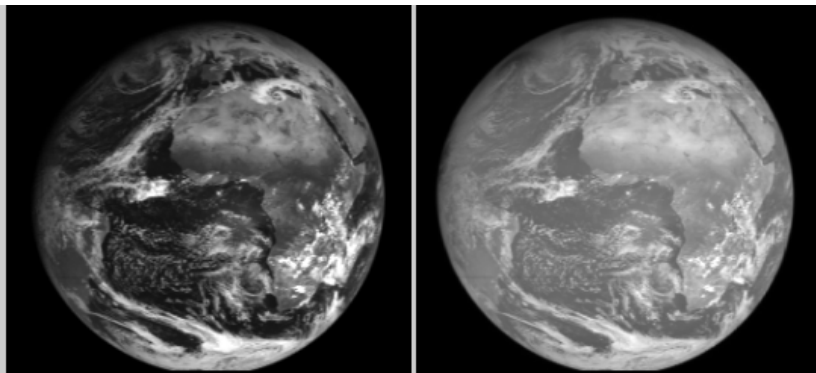
*SEVIRI imager on METEOSAT provides geolocation, spectral info for unfiltering and cloud identification enabling fluxes to be calculated every 15 minutes*



*One day of GERB observations 15 minute resolution fluxes for 26<sup>th</sup> June 2004*

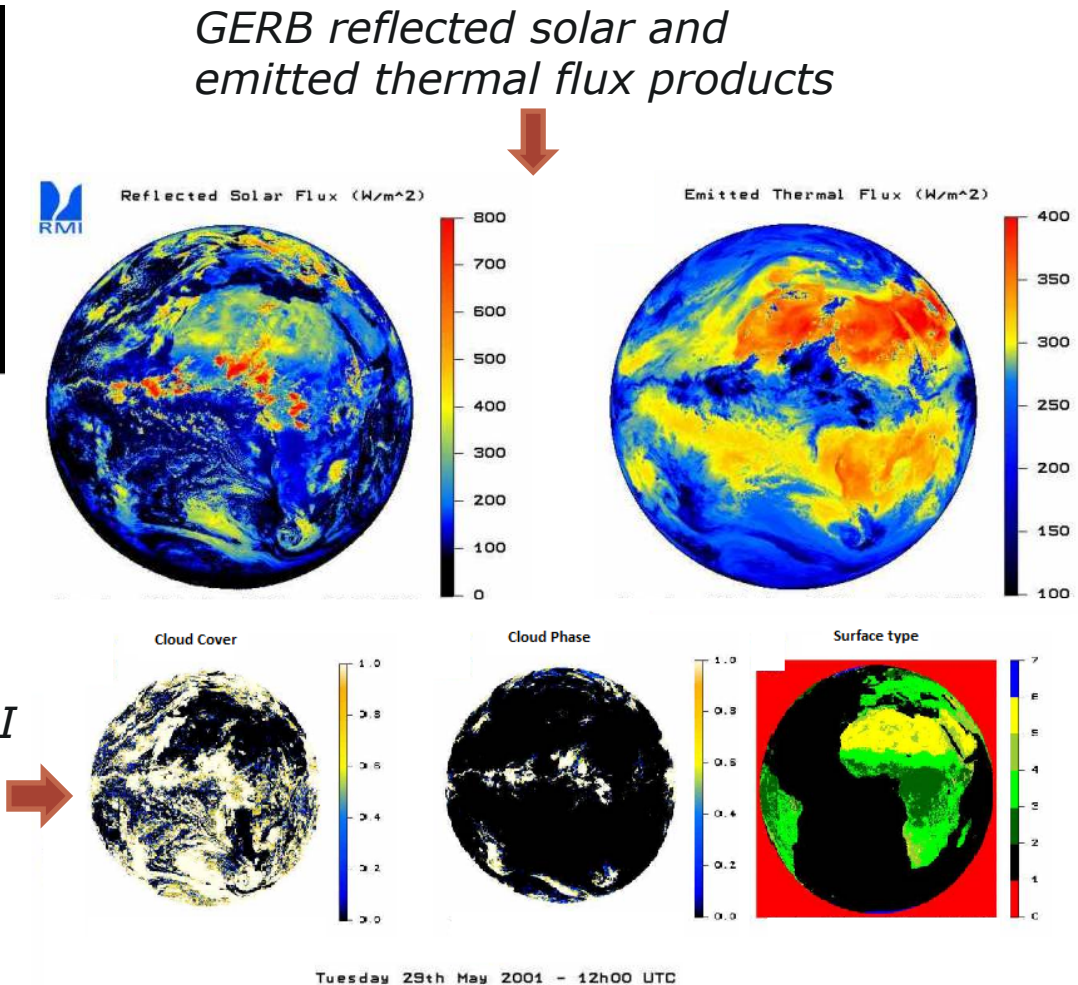


## GERB data



*GERB Broadband observations  
in SW 0.4 to 4 $\mu$ m and TOTAL  
0.4 to >100 $\mu$ m channels*

*Use scene information from SEVIRI  
and anisotropic factors based on  
CERES TRMM ADMs (SW) and  
theoretical regressions (LW)*



*Data record available from early 2004; total mission (4 instruments) expected to extend to at least 2018*



## GERB data products

### **L1.5: Non Averaged Non Rectified Geolocated (NANRG) Ed 1**

*instantaneous filtered **radiances** (3 SW & 3 TOTAL scans ~17 mins),  
uncorrected for instrument spatial and spectral response,  
irregular grid at point of observation ~ 50km resolution @ nadir  
available <http://ggsps.rl.ac.uk> quality summary available*

### **L2.0: Averaged Rectified Geolocated (ARG) Ed 1**

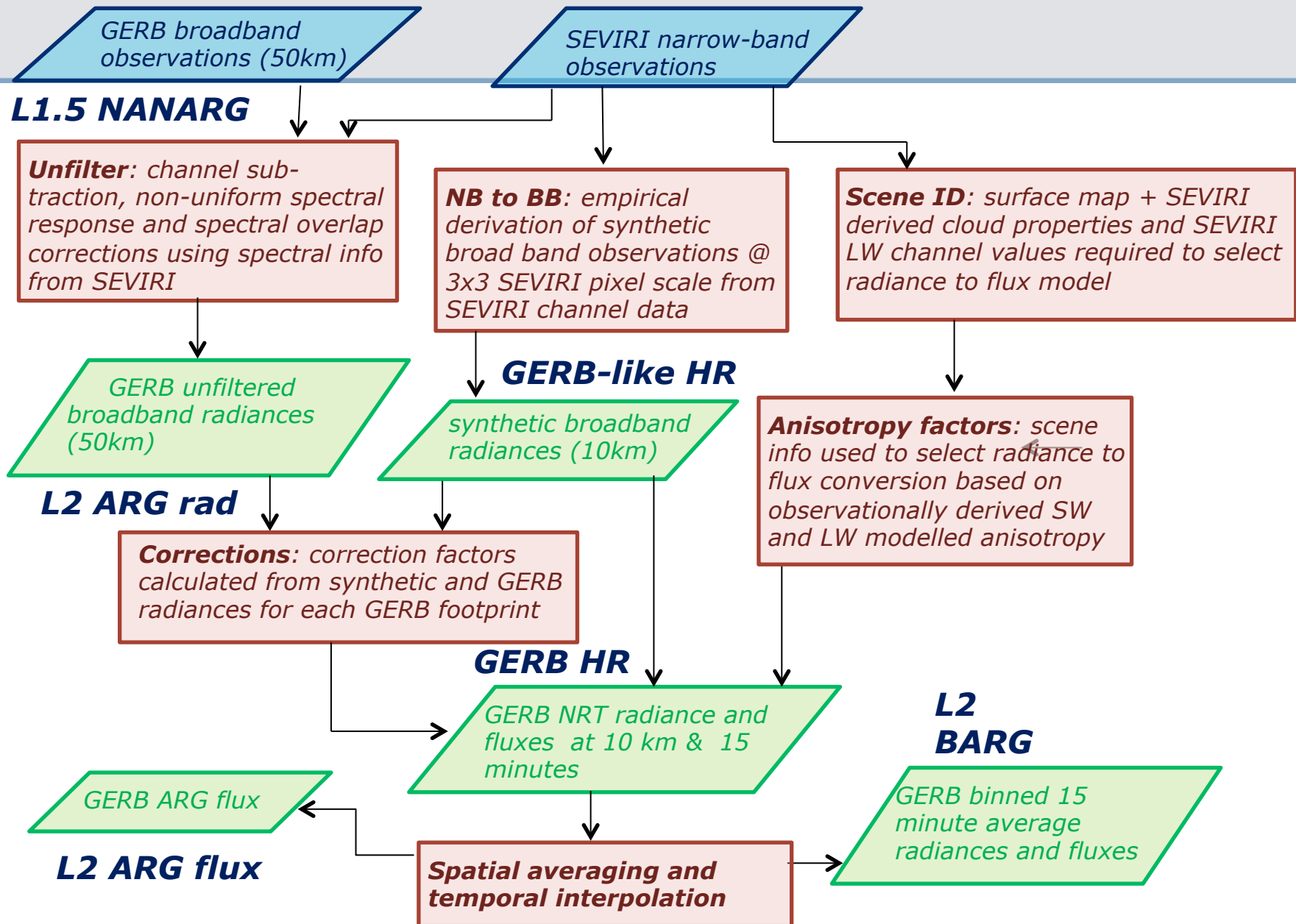
*unfiltered reflected solar & emitted thermal radiances and fluxes  
interpolated to regular fixed grid, 3 scan average ~50km resolution @ nadir  
3 scan average (PSF effect not removed)  
available <http://badc.nerc.ac.uk> quality summary available*

### **L2.0: Binned Averaged Rectified Geolocated (BARG)**

*unfiltered gridded reflected solar and emitted thermal radiances and fluxes  
15 minute uniform average on regular grid 45km @ nadir  
Ed 1 includes fill values for glint and twilight (currently being processed)  
Ed 1 will be released <http://badc.nerc.ac.uk>  
NRT without fill values available <http://gerb.oma.be> without quality summary*

### **L2.0: High Resolution (HR)**

*Resolution enhanced gridded SW & LW radiances & fluxes  
15 minute snapshot at SEVIRI acquisition time  
10km (3x3 SEVIRI pixels) sub satellite  
available from <http://gerb.oma.be>*

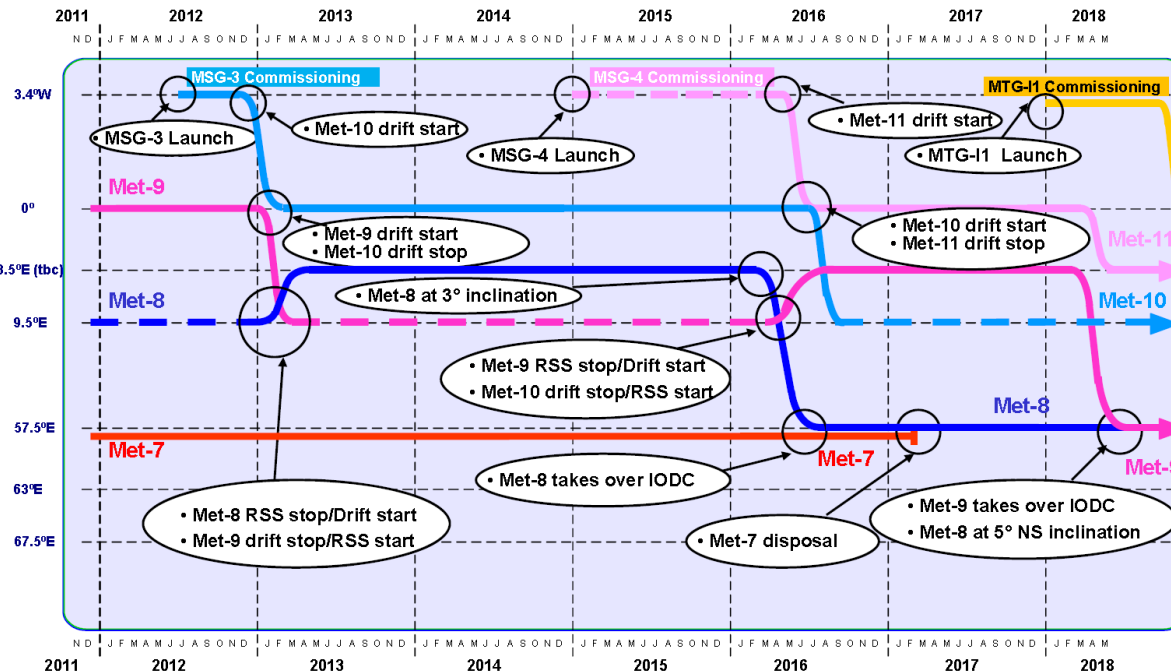


## Status summary

- GERB 2 (METEOSAT-8):
  - Launched 2002, Operational instrument Feb 2004 – May 2007 @ 3.5 West
  - Current position 3.5 East
  - Satellite sun sensor issue → good data only possible Nov. – Feb.
- GERB 1 (METEOSAT-9):
  - Launched late 2005, Operational instrument May 2007 – Jan 2013 @ 0 deg
  - Current position 9.5 East
  - Since Jan 2012 continues data acquisition; processing changes needed to produce L2
- GERB 3 (METEOSAT-10):
  - Launched 2012, Operational instrument Jan 2013 – ~~present~~ 27<sup>th</sup> April 2013 @ 0 deg
  - Current position 0 deg
  - Mirror failed to restart after anomaly (issue remains open)
- GERB 4 (METEOSAT-11):
  - Expected launch date July 2015, to be followed by in orbit storage period.
  - Returned to RAL for modification after integration tests failure late 2013
  - Successfully re-integrated on satellite in Cannes last month

# Geostationary Satellite Status

## Meteosat Long-Term Planning Perspective

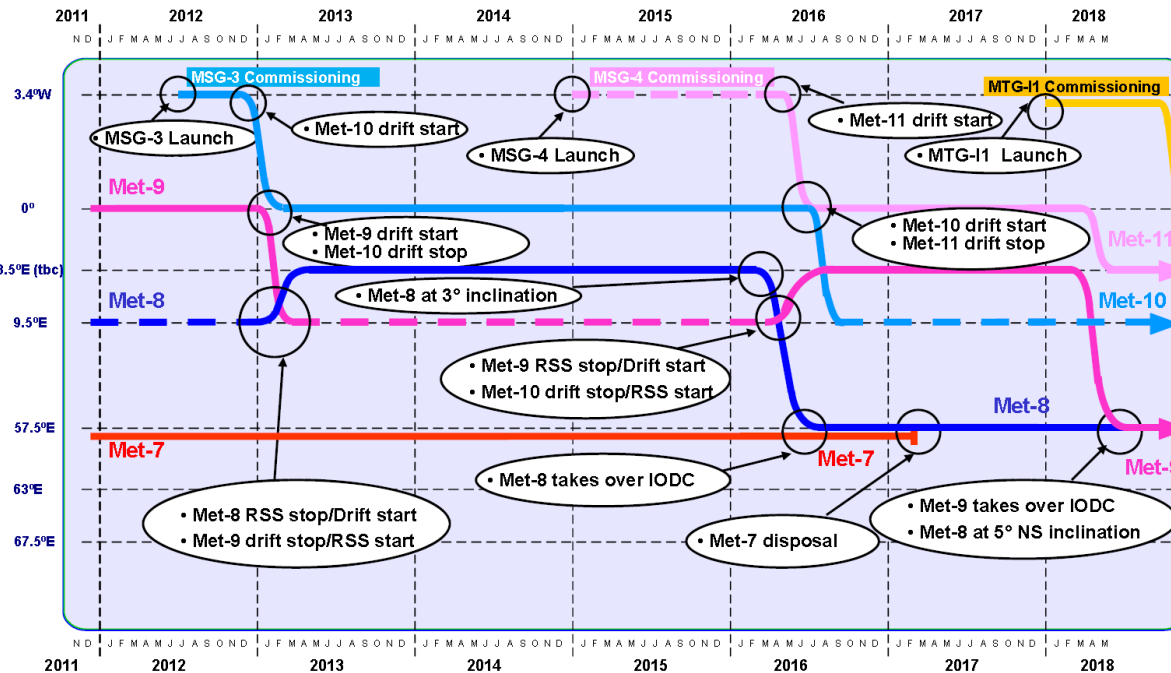


- **MET-9 (MSG-2/GERB1)**
  - Operational satellite until mid Jan 2013
  - Moved from 0° to 9.5°E 18<sup>th</sup> Jan – 5<sup>th</sup> Feb 2013
  - SEVIRI performing RSS
- **MET-10 (MSG-3/GERB3)**
  - Operational satellite since mid Jan 2013
  - Satellite move from 3.4°W to 0° 15<sup>th</sup> – 23<sup>rd</sup> Jan
  - SEVIRI FSS
- **MET-11 (MSG-4/GERB4)**
  - Launch date planned for mid-late 2015
  - In-orbit storage period after brief commissioning
- **MET-8 (MSG-1/GERB2)**
  - Moved from 9.5°E to 3.5°E 1<sup>st</sup> – 12<sup>th</sup> Feb 2013
  - Option to move to 57°E in 2016 is TBD



# GERB Status

## Meteosat Long-Term Planning Perspective

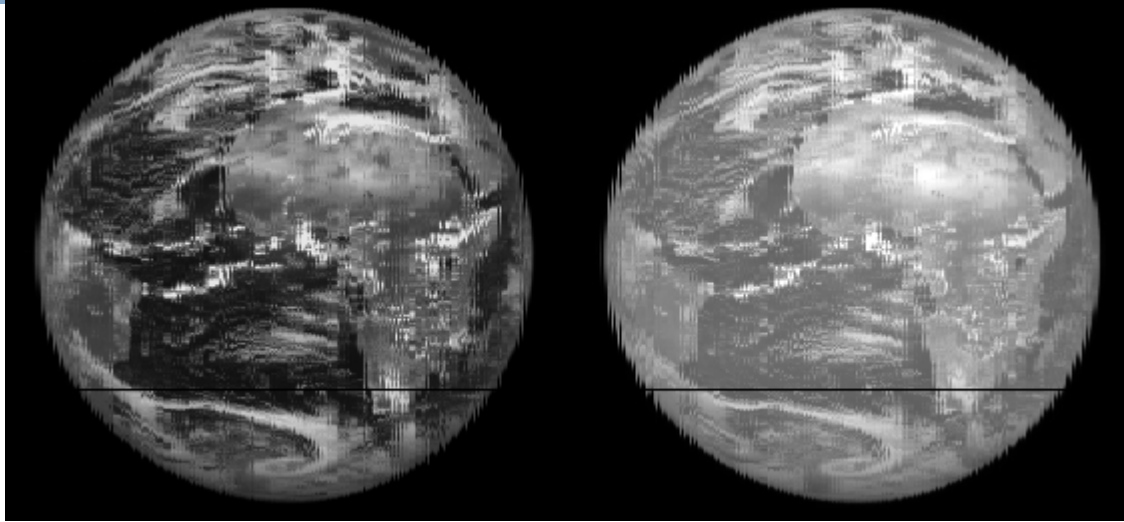


- MET-9 (MSG-2/GERB1)
  - GERB 1 operating in NORMAL mode
  - No processing to level 2 due to lack of co-incident SEVIRI
- MET-10 (MSG-3/GERB3)
  - GERB 3 operated in NORMAL mode Nov 2012 to 14<sup>th</sup> Feb 2013 before eclipse period
  - Restarted April 24<sup>th</sup>, unrecovered mirror stopping April 27<sup>th</sup>
- MET-11 (MSG-4/GERB4)
  - GERB integrated on spacecraft at Cannes
- MET-8 (MSG-1/GERB2)
  - GERB operation limited by use of Earth sensor
  - Sun sensor available during some months, post GSAG EUMETSAT have agreed to use this sensor when possible so GERB operation is feasible during these periods

## GERB 2 & GERB 1 operational record

- GERB 2 Edition record 24<sup>th</sup> Feb 2004 – 10<sup>th</sup> May 2007
  - Calibration update (x0.974) due to updated ground source calibration should be applied by users to SW fluxes and radiances
- GERB 1 Edition record 1<sup>st</sup> May 2007 to 13<sup>th</sup> Jan 2013
  - Offset between GERB 1 and GERB 2 calibration at point of change documented but uncorrected in Edition 1 data
- Edition 1 archive currently ARG data, filled BARG & HR data currently being processed and will be added as available.
- Edition 1 uses fixed spectral response → reduction in SW signal due to loss of SW response present in these data to be addressed in Ed 2.

## GERB 2 current status



*Recent operations have re-enabled redundant communication circuit, mitigating de-orbit failure risk.*

*Lobby via council may be required to move over Indian ocean after 2015 – decision to be made soon*

- Instrument itself working nominally
- Satellite Sun-sensor which provides pointing information is seasonally obscured
- Until this year EUMETSAT has been using the noisier Earth sensor at all times and processing SEVIRI observations with adapted processing, so no usable GERB 2 data since Feb 2012
- This year EUMETSAT have agreed to return to use of sun sensor when available, will obtain GERB 2 data November 2014 – Feb 2015.

## GERB 1 current status

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- Continues to obtain Level 1.5 data and is generally operating well
- Moved to 9.5 E in Jan 2013.
- No coincident imager data from this METEOSAT since Feb 2013
- Changes to the processing required to produce level 2 data – to be addressed in the future.

## GERB 3

- Successfully commissioned and early results indicated improved pointing accuracy compared to previous instruments
- First mirror stopping event on Feb 4<sup>th</sup> 2013, instrument required a power cycle to recover
  - New mirror control system understood to 'require more intervention when obstructed'
  - Restarted easily and runs well subsequently
- Placed in SAFE for first eclipse period
- Restarted well April 24<sup>th</sup>, but suffered a second mirror stopping event 27<sup>th</sup> April
- Mirror failed to restart after a power cycle
  - Subsequent attempts to start have so far failed
  - Root cause analysis implicates bearing debris as initial cause of stopping
  - System tests at RAL indicate a control system weakness at start-up after a power cycle likely contributing to failure to recover
  - Some further tests are planned before it can be determined if the situation is unrecoverable, timetable currently being agreed with EUMETSAT.



## GERB 4

- Failed integration tests at CANNES
  - Mirror failed to rotate when commanded although not obstructed
- Integration fail and GERB 3 mirror anomaly initiated GERB 4 mod
  - Mirror control system update
    - » Separate start-up circuit independent of position information installed
    - » Additional controls to retain responsively in the case of large disruptions
    - » Selectable (50% and 100%) levels to limit maximum torque available
- Returned to CANNES and successfully re-integrated on satellite Sept 2014
- Launch planned July 2015
- Short commissioning period followed by in-orbit storage.

## Current situation summary

- METEOSAT-10 SEVIRI
  - the current operational instrument performing Full Earth Scanning from 0°
- GERB 3 (METEOSAT-10 at 0°)
  - NOMAL operation and level 2 fluxes November 2012 – mid Feb 2013 & April 24-27<sup>th</sup> 2013 only
  - Pending final statement on recovery
- GERB 1 (METEOSAT-9 at 9.5°E)
  - Edition flux record stops mid Jan 2013
  - GERB 1 level 2 fluxes produced up to mid Feb 2013
  - GERB 1 NORMAL operation and level 1.5 ongoing
- GERB 2 (METEOSAT-8 at 3.5°E)
  - Can be operated but no useable image quality if Sun Sensor not used
  - Will be operated on Sun sensor November 2014 – Feb 2015
- GERB 4 (MSG-4 on ground)
  - Modifications to control circuit completed
  - Limited commissioning expected 2015 at 3.4°W
  - NORMAL mode data November – December 2015 ?
  - Unknown period in storage until operational